

Focus *North*

CANADA

2010

Northern Development Ministers Forum



**Climate Change and
Best Management
Practices in the
Boreal Forest**

**Thunder Bay, Ontario
August 30 – September 2, 2010**



Cover photo of caribou courtesy of
Wildlife Resource Consulting Services MB Inc.



2010

Northern Development Ministers Forum



Climate Change and Best Management Practices in the Boreal Forest

The Northern Development Ministers Forum was established in 2000 to advance the diverse and common interests of northerners as well as to raise awareness of the accomplishments, contributions and potential of Canada's North.

Goals

- To identify, act and provide leadership on strategic actions to advance the socio-economic development of the North.
- To strengthen the position of the North in provincial, territorial and national priorities.
- To further enhance cooperation between northern provincial jurisdictions, territorial jurisdictions and the Government of Canada.
- To share information.
- To organize an annual conference as a forum for the Northern Development Ministers to set priorities.

Priority Projects

Each year the Northern Development Ministers establish priority projects to address distinct northern development opportunities and challenges. At their annual meeting in 2008 in Yellowknife the NDMF Ministers directed senior government officials within the Climate Change Working Group to:

- Continue committee work to share information on climate change impacts on northern development and on best practices to address those impacts;
- Build on establishing links and update information on climate change in the North on the Focus North web site;
- Establish connections to work on climate change (e.g. Council of the Federation, CCME);
- Continue work of climate change with respect to "Best Practices in Boreal Forest Management".

In response to the above directive this discussion paper presents information on climate change impacts on northern economies in general, and on boreal forest management specifically for consideration by Ministers at the 2010 Northern Development Ministers Forum in Thunder Bay.

Member Jurisdictions

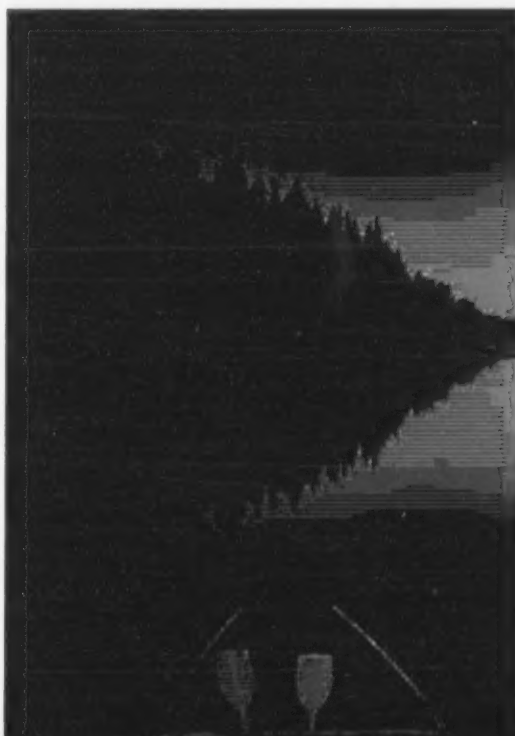
Yukon
Northwest Territories
Nunavut
British Columbia

Alberta
Saskatchewan
Manitoba
Ontario

Québec
Newfoundland and Labrador
Canada – INAC

Acknowledgements

The senior officials working group responsible for development of this briefing paper wish to express their thanks to those jurisdictions and public and private sector individuals who responded to our request for information and whose contribution is reflected in this paper.



2010 Northern Development Ministers Forum

Briefing Paper

Climate Change and Best Management Practices in the Boreal Forest

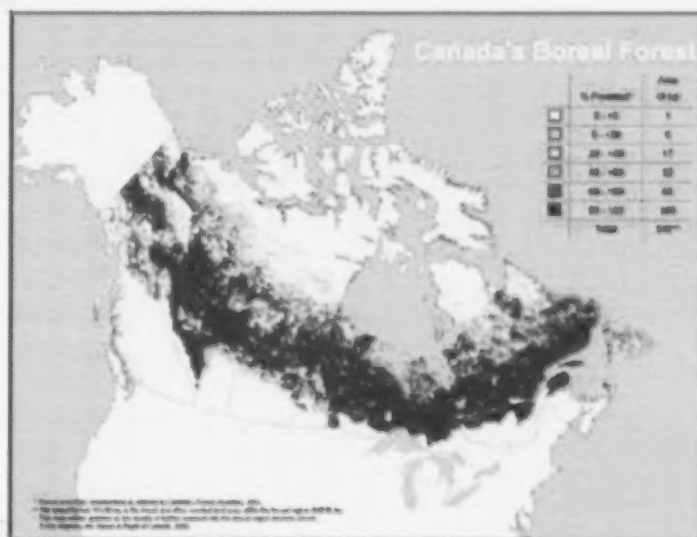
Introduction

At the 2008 Northern Development Ministers Forum, senior officials were directed to form a working group to explore the impacts of climate change on northern communities and economies in general, and more specifically on boreal forest management practices. This briefing paper is a synthesis of information collected from NDMF jurisdictions by the working group, to prepare Ministers for discussion and engagement and to recommend further action. Many related issues are not covered in this paper, e.g., the release of metals under changing temperature conditions, the need for more transition planning for communities that might be highly affected, etc. Such issues may be very significant, but our goal is to focus on climate change and the boreal forest. *(Note that numbered lists do not imply ranking.)*

Background

Covering about 30% of Canada's land mass, the boreal forest constitutes 77% (or 307 million hectares) of Canada's 402 million hectares of forested and other woodlands. A mosaic of forest, barren land, lakes, rivers, meadows and peat lands, the boreal region is integral to Canada's history, culture, economy and natural environment¹. The boreal forest provides ecological goods and services, employment, subsistence livelihoods, wood products, recreation and many more values and resources. Forests play an important role for northern residents, especially Aboriginal peoples whose traditional values are embedded within the forests that surround their communities.

Where trees are sparse and small, forestry is focussed at the community level. Outside of a few small-scale sawmills, the markets are local fuel wood for heating. Where the growing season is longer, northern economies are highly dependent on forest resources – timber (large- and small-scale manufacturing); hunting, trapping and fishing (traditional, commercial and recreational); tourism; and forest ecosystem services, such as, high quality water of sufficient quantity for domestic and industrial use.



¹ <http://canadaforests.nrcan.gc.ca/article/borealforest>

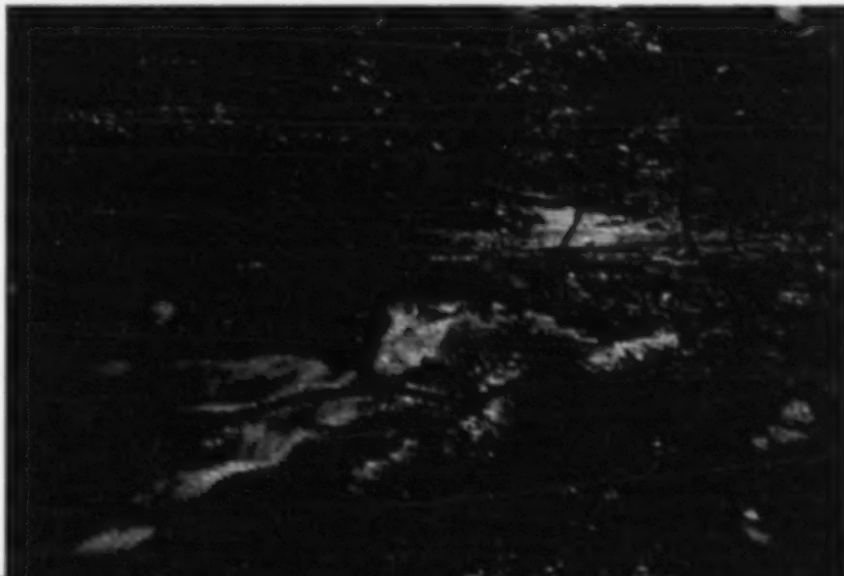
Climate change is expected to affect northern communities and economies in many ways:

1. Coastal navigation makes possible the delivery of supplies to isolated communities, for instance, those located in Northern Québec; based on the lengthening of navigation seasons, decreased transportation costs can be expected.
2. Community and industrial infrastructure as well as traditional lifestyles are being threatened, for example, by the melting of permafrost and the accelerated disappearance of ice packs. Hunting conditions are becoming more difficult, some species may decline while populations of other species (eg, predators) could increase. An outcome of these changes will likely be increasing dependence on government transfers and social assistance as traditional food and craft sources become scarcer.
3. Increased average temperatures might lead to longer growing seasons, resulting in expansion of the range of agriculture where soil is fertile. Increased drought conditions may affect existing agriculture practices, e.g., considerations of crop choices, cost of irrigation, etc., and provide an impetus for redesigning agriculture practices.
4. Mining and forestry supplies and equipment depend on the transport of heavy loads in winter over ice roads and bridges, and timber is harvested from wet sites when the ground is frozen. A shortened cold season may increase costs and make northern producers less competitive, as well as negatively impact road access to communities.
5. Infrastructure (e.g., winter roads, airstrips, marine docks and tailings sites) will need more maintenance. The need for innovation will spark new designs due to the expected shorter winters, melting of permafrost, changes in ice cover, and increased variation of drainage and runoff.
6. Increased drought in certain locations might reduce the available water supply needed for oil sands, mills and other resource development. Innovation and adaptation may lead to less water intensive methods of resource development.

The dependence on traditional subsistence economies is greater in more remote communities where there is less access to outside markets or goods. Climate change has economic implications for northern individuals and households in terms of damage to equipment, decreased or lost traditional food catches, and diminished quality of traditional foods. The ability of most individuals and communities to adapt will be complicated by existing issues, including relatively poor education levels and health situations, insufficient investments, delayed treaty settlements, and other competing priorities and social issues.

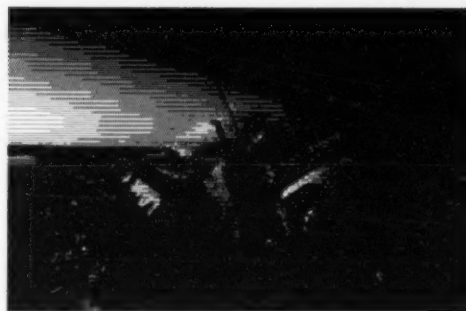
The climate change impacts observed in communities with respect to subsistence activities can be grouped into the following categories:

- access to resources (ability to travel on the land or ice to go to hunting or fishing camps);



- safety and predictability of weather events (influences decisions when to travel); and
- plant and animal species availability (the distribution, abundance, health and movement of species may change as new species appear, or established ones alter the timing of their migration).

Adaptation strategies relate to adjusting or modifying patterns of subsistence living, e.g., changing how, when, and where harvesting occurs; harvesting a mix of different species; and trying to minimize risk and uncertainties, e.g., waiting for land to dry, or weather to improve before hunting. Networks within communities for sharing food and other resources and intercommunity trade are long-term, culturally-ingrained mechanisms which could continue to be used to adapt to changes.



Climate change is expected to affect boreal forest management in many ways:

1. Increased costs of planning, measuring, and tending forests; extracting wood fibre; and milling forest products, due to: a) transportation challenges from melting permafrost, ice roads and increased road maintenance; b) increased extreme weather events causing more forest fire, ice storm and wind damage to forests; and c) shifts in plant and animal species composition which will affect forest growth, the availability of forest resources for products and the ability of producers to react to market shifts.
2. Changes in the quantity and quality of wood fibre supply, for example, some regions in Northwestern Ontario are vulnerable due to projected lower precipitation, which would a) reduce tree growth and increase the number of knots, leading to less fibre supply and less high quality timber; and b) increase the frequency of wildfires, which would reduce the amount of fibre available for resource use.
3. Changes in species composition of trees, vegetation, wildlife habitat and other biota, which could exacerbate social, environmental and economic issues due to the slow rate that people are able to adapt to such changes, especially people with traditional lifestyles. In contrast, innovators and entrepreneurs may diversify economies owing to a broadening spectrum of resources and societal uses of forest products.
4. Increased demand for "green" products to reduce the rate of future climate change, which leads to increased production of bio-products, e.g., fibre for energy production. Wood products store carbon (versus non-wood products), and prompt reforestation speeds up carbon capture in a forest. The development of "green" forest products and services could create jobs in forest-dependent regions, and might result in capital investment and resources utilizing smaller trees.

According to the International Panel on Climate Change, in *Ontario's Forests and Forestry in a Changing Climate*²: *Sustainable forest management that maintains forest carbon stocks and provides a sustained yield of wood products provides the best long-term climate change mitigation strategy for forests. Wood products from forests store carbon, but we can also reduce greenhouse gas emissions from fossil fuels by using wood as an alternative energy source (either burned directly or burning methane generated by wood products in landfills). Solid wood products have considerably lower energy intensity than building materials such as steel, aluminum, brick, and concrete. Therefore, using wood in place of such other materials reduces emissions of greenhouse gases and is an indirect way that forests can contribute to mitigating climate change.*

² *Ontario's Forests and Forestry in a Changing Climate*, Ontario Ministry of Natural Resources, September 2008, p. i, <http://www.mnr.gov.on.ca/stdprodconsume/groups/tr/@mnr/@climatechange/documents/document/276928.pdf>

Climate change issues have been at the forefront as the forest industries (i.e., lumber, pulp and paper) and governments struggle with the extended downturn (since 2005) in the markets for forest products. The Canadian forest sector and forest-dependent communities currently face a complex set of challenges including:

- the world-wide recession, tight credit markets, and uncertainty around the volatility and rate of economic recovery;
- various governments providing subsidies towards their forestry industries;
- a fluctuating Canadian dollar;
- repositioning resulting from the 2006 Softwood Lumber Agreement;
- consolidation of forest products companies;
- fluctuating fuel and energy prices;
- strong international competition;
- the regulatory burden and harmonization of provincial and federal requirements; and
- inter-provincial and United States border issues.

Several of these challenges are expected to be short-lived, unlike the effects of climate change.

Current Status

Northern communities already experience impacts from changing climates that affect people's safety, livelihoods and resources. Climate change has made a noticeable impact on the boreal forest in the Northwest Territories and Yukon, with evidence of drought stress, infestations of spruce bark beetle and resultant forest fires. The mountain pine beetle outbreak is moving north in British Columbia and Alberta, where previous cold periods in the fall or winter kept populations at endemic levels. Unusual weather events have transported large flights of beetles over mountains to infest areas where there historically haven't been any mountain pine beetles. In 2010, early wildfires occurred in both these provinces, owing to variable precipitation of both snow and spring rains.

Melting permafrost is affecting surface and subsurface hydrology, slope stability and soil moisture conditions, and is also affecting forest access because of deteriorating roads. Water tables are fluctuating, again owing to more variable precipitation. This is evidenced in Northern Saskatchewan and Manitoba as grasslands expand and wetlands dry, the results of more occurrences of and prolonged drought. All this evidence supports the understanding that changing climates result in more extreme weather conditions across a broader temporal period than historically experienced.

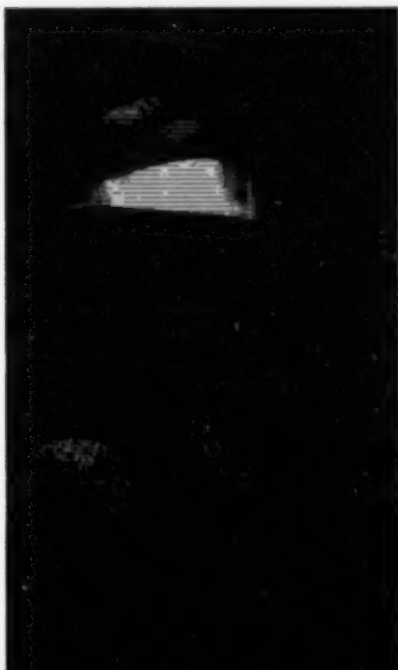


In spite of the Intergovernmental Panel on Climate Change publications that highlight the changing global climates and the need to rethink forest management, debates still flourish in Canada and internationally on the values of keeping large tracts of the boreal forest intact – storing carbon, filtering water, providing wilderness habitat – or attempting further development that promises to provide sustainable jobs and green products. Incredible advances have been made in recent years in understanding the role that forests play in the maintenance of biodiversity, on carbon budgets, and for the provision of many other essential ecosystem services. Forest professionals and managers are realizing we cannot rely on forest management policies and practices based on empirical observations of past conditions in order to manage climate change impacts we may not yet fully appreciate.



The recent forest sector downturn provides an opportunity to restructure forest management and the forest industry in general, but also specifically for the northern part of the commercial boreal forest, incorporating goals from climate change action plans (e.g., British Columbia, Alberta, Manitoba, Ontario, Québec, Newfoundland) and recent forest legislation (e.g., *Forest Resources Act* (Yukon), *Forest Occupancy Act* (Québec), *Zero Net Deforestation Act*, (BC)). In May, 2010, the Canadian Boreal Forest Agreement (CBFA)³ was ratified by 21 forest companies who are members of the Forest Products Association of Canada and commit to the highest environmental standards of forest management and conservation, while 9 environmental organizations commit to global recognition and support for FPAC members efforts. An early component of the Agreement is the moratorium⁴ of logging on nearly 29 million hectares of boreal forest representing virtually all boreal caribou habitat within company tenures, to allow for intensive caribou protection planning while maintaining essential fibre supply for uninterrupted mill operations. Another component is the suspension, by participating environmental organizations, of divestment and “do not buy” campaigns targeting the boreal operations and products of companies participating in the CBFA.

The boreal forest is a complex ecosystem that will continue responding and adapting to climate change in ways we have not yet observed. Complex systems require interdisciplinary approaches, and communities can contribute local knowledge and values that will help identify revised and evolving best management practices and opportunities within forests.



³ <http://www.canadianborealforestagreement.com/>

⁴ Suspension of harvesting and road building is for areas within the identified Boreal Caribou range, planned for April 1, 2009 to March 31, 2012, with several goals agreed to by the signatories including the recognition “that successful implementation of many aspects of the CBFA will require the support of and/or actions by governments [including First Nations] and the support of a broad array of interests including communities”, see <http://www.canadianborealforestagreement.com/> for further details.

Several recent initiatives are addressing climate change and forest management challenges:

1. Given the economic, social, and cultural importance of forested ecosystems and the forest sector to Canadians, the premiers, through the Council of the Federation in January 2008⁵:
 - a) identified forest adaptation to climate change as a major national issue;
 - b) endorsed current initiatives of the Canadian Council of Forest Ministers (CCFM); and
 - c) further directed the CCFM to collaboratively address this issue using science and technological innovation in support of emerging policy requirements.

The CCFM Climate Change Task Force, composed of representatives from many Canadian jurisdictions, has been established to develop strategic tools and techniques in support of adaptive forest management in a rapidly changing climate. The CCFM responded to the Council of the Federation by producing reports entitled *Vulnerability of Canada's Tree Species to Climate Change*, and *A Framework for Forest Management Offset Protocols*. The tree species vulnerability study is being followed by an initiative aimed at enhancing the capacity of Canada's forest sector to adapt to climate change, with three primary objectives.

- enable the assessment of the vulnerabilities/opportunities that climate change poses to sustainable forest management (SFM) in Canada;
- identify potential adaptation options; and
- provide information, knowledge, tools, and venues to enable the mainstreaming of climate change adaptation into sustainable forest management.

A state of knowledge report, *Climate Change and Forest Management in Canada: Impacts, Adaptive Capacity and Adaptation Options*, was completed in 2010, concluding:

Anticipatory and planned adaptation can reduce potential negative impacts of climate change and allow managers to take advantage of beneficial impacts. Structured assessments can help determine areas of vulnerability (or opportunity), and can help identify possible adaptation actions and strategies. In some cases options can be implemented now that reduce current climate vulnerability while also building adaptive capacity for the future ("no-regrets" options)⁶.

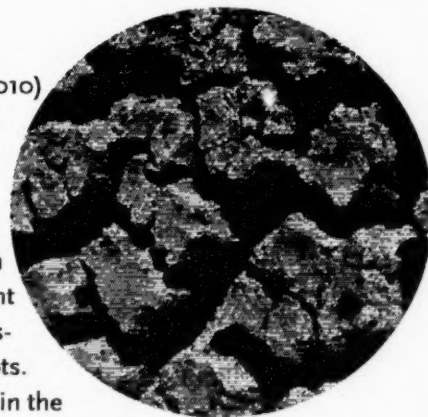
2. The *Forest Resources Act* and its eight regulations (currently under development) in the Yukon recognize that the long-term health of the Yukon's forests must be maintained and protected for the benefit of current and future generations, and that the use of forest resources can play an important role in the economy. The community-based *Sustainable Forest Management Plans* include considerations of climate change.

⁵ *Canada's Premiers: Taking Action on Climate Change*, http://www.councilofthefederation.ca/pdfs/CCCommPiece_0718-FINAL.pdf

⁶ http://www.sfmnetwork.ca/docs/e/SOK_2010_Johnson.eta_%20Climate%20Change_En.pdf, p. 7



3. In the Northwest Territories (NWT), the recently tabled (February 23, 2010) *Biomass Energy Strategy* (BES) is an integral part of the *Greenhouse Gas Strategy*. The BES will lead to an increase in the use of biomass products, such as wood and wood pellets, by promoting the use of local biomass products and reducing our dependency on diesel and other fossil fuels which are hauled long distances. With more than 33 million hectares of forested land in the NWT, this will lower the carbon footprint of the north, create more local employment, and develop long term sustainable resource management with more focus on community woodlots. For example, in Fort McPherson, there has been an incredible increase in the growth rate of willow, which is now being considered as an alternative fuel for district heating systems.



4. The Québec Government launched, in 2006, its *Climate Change Action Plan 2006-2012* and imposed a carbon levy on motor fuels to implement it. A federal government contribution was later added. The plan consists of 26 actions for both reducing GHG emissions and adapting to climate change in various sectors of Québec society. More specifically, with respect to forests and northern regions, actions range from programs in increasing public awareness to forest biomass energy recovery, as well as developing partnership initiatives. A large emphasis is also put on research and development projects, including the assessment of the province's forest resource and industry vulnerability. Anticipated impacts are taken into account in forest management practices. Other actions from the plan include evaluations and research concerning thawing permafrost and coastal erosion, and their impacts for a variety of infrastructure located in those sensitive areas.

In addition, action 26 from Québec's plan with a budget of \$10M is allocated to the Ouranos consortium's research and communication activities. Ouranos, a research network, conducts and helps to coordinate research on regional climatology, and impacts and adaptation to climate change, essentially in Québec in all sectors of activity including forest resources and northern regions. A recently published report, *Savoir s'adapter aux changements climatiques*, summarizes findings from the various projects the consortium develops. The report will soon be available in English.

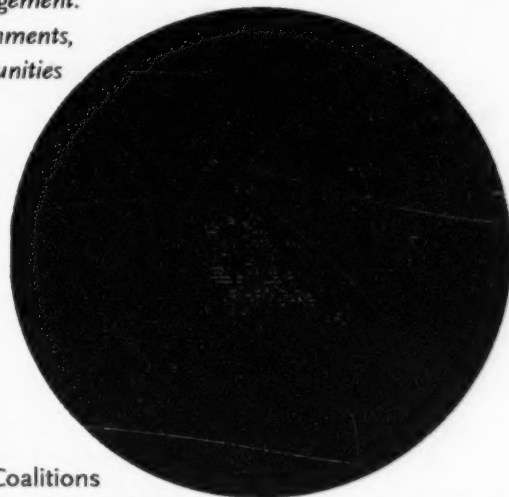
The Comité scientifique sur la limite nordique des forêts attribuables is currently evaluating, in partnership with scientists of various organizations, the northern limits of timber production in Québec. Knowledge acquisition in the field will be used in the short term to map the economically productive boreal forest, and also to understand the influence of wildfire.

5. The Ontario Ministry of Natural Resources has developed a program-level strategy and action plan, titled *Responding to Climate Change Through Partnership*, using the process of
- a) understanding climate change,
 - b) mitigating the impacts, and
 - c) helping Ontarians adapt.

The proposed *Far North Act* (introduced in June 2009), if passed, will enable a community-based, land-use planning process that gives First Nations a leadership role in determining areas to be protected and identifying where sustainable development of natural resources may take place. Sustainable development must benefit local First Nations and take into consideration ecological and cultural values.

In December 2009, Ontario released *Adapting to Climate Change in Ontario*, which includes a series of recommendations by a panel of experts. Specific to forestry, the report recommends that Ontario should⁷:

- *in collaboration with the forest industry, the research community, and leaders of forest-based communities, should review current forest policies, management structures and regulations... to ensure they either take climate change projections into account or are sufficiently flexible to allow the integration of climate change adaptation considerations into forest management.*
- *seek consensus in Ontario among the forest industry, governments, the research community, and leaders of forest-based communities on a suitable methodology for assessing the climate change vulnerability of the... Boreal Forest and their associated forest-based communities, and then undertake a comprehensive regional vulnerability assessment... and*
- *initiate the development and ongoing validation of models aimed at elucidating cumulative impacts of multiple climate change stressors on... Boreal forest ecosystems and the implications for forest management practices.*



6. Responding to the mountain pine beetle (MPB) epidemic in British Columbia (BC) led to the formation of Beetle Action Coalitions (BACs), where communities work together and strategically plan mitigation and adaptation to impacts. The Omineca BAC, which covers most of the affected area in Northern British Columbia, reported to the Province in late 2009 with their recommendations for diversifying economies in communities most affected by the MPB.

On May 4, 2010, the Province returned nearly \$2.9 million collected as carbon taxes to communities across BC that have signed on to the BC Climate Action Charter, committing to be carbon neutral by 2012. These local governments are promoting more compact and transit-oriented development, as well as investing in greener infrastructure such as community energy systems, green building retrofits, fuel efficient fleet vehicles and micro hydroelectricity projects. Citizens' Conservation Councils, formed in 2008, represent their region's youth, seniors, municipal government, local businesses, First Nations, community groups and educational institutions, and helped form a grassroots regional network that is stimulating climate action in every region of the province. They reported to the people of BC on December 23, 2009, advising government on the best ways to encourage individuals, groups and communities in their regions to learn more about climate change, participate in climate action initiatives and reduce greenhouse gas emissions.

The *Future Forest Ecosystems Initiative* aims to adapt BC's forest and range management practices to maintain and enhance the resilience and productivity of ecosystems as the climate changes. This initiative is increasing the understanding of ecological processes and changes associated with climate change, and associated risks to forest and range ecosystem values, through research, forecasting and monitoring. Knowledge will contribute to policy evaluations and revisions as well as improved forest practices.

⁷ <http://www.ene.gov.on.ca/publications/7300e/pdf>, pp. 51-52

7. Alberta is collaborating with agencies across Canada for wildfire management, and working closely with British Columbia for fuel management of mountain pine beetle affected forests especially around communities. The Alberta government identified adaptation actions in its *Climate Change Strategy: Responsibility. Leadership. Action*⁸:
- develop a provincial Climate Change Adaptation Strategy to provide overall direction, identify measures and indicators of climate change, provide a source of information about the impacts, and identify risks and vulnerabilities. Focus is on water, biodiversity, energy, municipal infrastructure, agriculture and forestry;
 - coordinate policy and research on adaptation; and
 - communicate and inform Albertans on the potential impacts of climate change.

One example of biophysical adaptation is found in the forest genetics program, which is evaluating the adaptability of tree species to different climates and providing management options for the future.

8. Manitoba's *Forest Health Protection Act*, enacted in 2009, will allow pest specific regulations and management strategies to be developed for new potential pests that might migrate because of changing climates (e.g., Emerald Ash Borer).
9. In late 2009, the Government of Newfoundland and Labrador established the new Office of Climate Change, Energy Efficiency and Emissions Trading, located in Executive Council and reporting to the Premier, to act as lead within the Provincial Government for strategy and policy development on climate change, energy efficiency and emissions trading. This new Office has been tasked with developing an update to the 2005 Climate Change Action Plan, an Energy Efficiency Strategy, a Greenhouse Gas Strategy for the Energy-Intensive Sector and a Climate Change Adaptation Strategy for northern Labrador. This new office will lead the development of these strategies in consultation with other key departments such as Natural Resources and Environment and Conservation, which continue to implement important programs to respond to this challenge. In July 2010, the Provincial Government concluded a consultation process to support the development of this work. On the forestry sector specifically, the Provincial Government is developing the *Climate Change Adaptation and Mitigation Policy for Forests*, to be completed in 2010, using the CCFM Climate Change study outcomes as a framework. Other initiatives in the forestry sector are under consideration in the ongoing strategy development process.

Concurrent to the policy and strategy development, the Department of Environment and Conservation are collaborating with the other Atlantic provinces and Natural Resources Canada to cost-share an \$8 million initiative to help communities adapt to climate change. While this Initiative continues to increase awareness around the changing climate, the focus is on identifying vulnerabilities and adaptation options. Critical



⁸ <http://environment.alberta.ca/ogog.html>

components of this work are the downscale climate modeling being developed for the province, as well as the evaluation of potential increases in flooding, erosion, and damage from extreme storm events for both inland and coastal areas. This information will be communicated to communities through the Community Vulnerability Assessment Tool, the related toolkit and through municipal associations.

10. On December 1, 2009, the Government of Saskatchewan re-introduced its climate change legislation that establishes the framework for how the province will meet its target for reducing greenhouse gas emissions by 20% from 2006 levels by 2020. Bill 126, *The Management and Reduction of Greenhouse Gases and Adaptation to Climate Change Act* (previously Bill 95), passed on May 3, 2010, is aimed at reducing greenhouse gas emissions to meet provincial targets, promoting investments in emission-reducing technologies and supporting adaptation planning initiatives. The Bill enables the establishment of the Climate Change Advisory Council, the Office of Climate Change, the Technology Fund and the Climate Change Foundation. Revenue from carbon compliance payments by large emitters will be retained in the Technology Fund for up to five years for approved emission-reducing investments in low-carbon technologies and processes. The Climate Change Foundation will support research and development, and demonstration projects to reduce GHG emissions in all sectors of the economy. The new Bill will also provide the authority to establish performance agreements with the unregulated sectors, such as, agriculture, transportation and residential and commercial buildings, to reduce greenhouse gas emissions and provide for an Environmental Code to establish standards, guidelines and best practices for measuring, reporting and reducing emissions by large emitters and other sectors.

Issues

Northern communities indicate they need:

1. Resources and knowledge to help them reduce the threats from wildfire, flooding, melting permafrost and other negative impacts associated with changing climates.
2. Improved forest practices that will provide more species and structural diversity across the landscape, leading to greater ecosystem resilience and more diversity of employment.
3. Opportunities, capacity and resources to build resilience for their communities, adapt to the effects of climate change, and take advantage of opportunities arising from climate change.
4. Economically feasible alternative energy sources.
5. Accessible, government-funded (i.e., non-proprietary) research on mitigation and adaptation.

Considerations

Governments and institutions are considering options and need to continue best practices that:

1. Model and understand hydrological responses to climate change, including sub-surface water flow regimes and permafrost melting, in order to understand effects on wildlife habitats and forest succession.

2. Manage threatened, endangered and species at risk, especially those that contribute to traditional lifestyles and economies, e.g., grizzly bear and caribou.
3. Monitor invasive and damaging species that are expected to thrive in the changing climate, e.g., bark beetles, budworms, root diseases, needle blights.
4. Invest in science and research, and consider the possibility of climate change effects in long-term planning, policy development, and investment decisions.
5. Promote the use of wood products from sustainably managed forests as a means to reduce greenhouse gas emissions and sequester carbon.
6. Examine the cumulative effects of intensive land use and development with a view of the changing climate.
7. Plan for changes in species composition and fire regimes in future forests.
8. Reflect a clear distinction between adaptation in response to climate change impacts and adaptation needed for other reasons.
9. Consider public acceptance and differences in value systems when adopting adaptation policies, since the public is more likely to accept and comply with policies they believe are fair and just.

Challenges

1. With the right motivation, individuals have the most flexibility to adapt. However, some people may resist adaptation because they a) do not see connections between human actions and climate change problems, b) may not believe that their actions will alter climate change effects, or c) may not view climate change as a risk. Adaptation by individuals will be more effective as part of a strategic and sustained effort, with community, regional, and broader communication and collaboration, to ensure adaptation actions do not simply transfer impacts to other jurisdictions or other generations.
2. There is a huge gap of knowledge on the socio-economic impacts of climate change on northern communities, which makes it difficult to design and implement effective long-term adaptation strategies. Strategic and collaborative research and analysis is needed all across communities in the boreal forest and non-forested north.
3. Community attributes – including social networks, social cohesion, economic and income diversification, and volunteerism – all contribute to adaptive capacity and resilience. Societal impacts from climate change will depend on factors such as wealth, infrastructure quality, emergency preparedness, health care, community vitality, economic and governance system structures, and population growth. Governance and development infrastructure within First Nations communities and regional governments often differ from those within standard municipal governments, and governments need to acknowledge and allow different drivers and motivators to help communities adapt.

Recommendations

1. Since consideration of changing climates is integral across sectors, and in particular for northern communities, future Northern Development Ministers Forums should have climate change considerations woven into each of the selected priority projects.
2. Ensure the outputs from the 2010 Northern Development Ministers Forum are communicated with the Canadian Council of Forest Ministers (CCFM) and the Climate Change Task Force (CCTF), and relationships between the Forum and these groups are established for ongoing communications. Encourage data sharing and provide effective access to data for more informed decision making.
3. Provincial/territorial climate action plans should influence revisions of boreal forest management practices and policies. Managers engaged in forest planning and policy making should consider emissions reduction, carbon sequestration, alternate/new uses of wood fibre, water consumption and conservation, tree and plant species migration, forest health, wildfire and community risks, and mitigation and adaptation to climate change within a coordinated and coherent framework.
4. Resource management agencies should consider providing opportunities for communities to plan and manage social, economic, environmental and biophysical responses and adaptation to climate change, for example, through community forest tenures.
5. Government departments and agencies responsible for forests, environment, land-use planning, community planning, and economic development should provide coordinated support for climate change adaptation training/outreach/communications and community capacity building, as well as for building internal government capacity.

Video References

The boreal forest and research into sustainable forest management is succinctly illustrated in these videos:

- 1) Canadian Council of Forest Ministers, Exploring Boreal Forest (<http://www.sfmcanada.org/english/ViewVignette.asp?vid=8> and <http://www.sfmcanada.org/francais/ViewVignette.asp?vid=8>, 2.5 minutes).
- 2) Sustainable Forest Management Network, Realizing the promise, considering the future, April 2009, (http://www.sfmnetwork.ca/html/newsroom_multimedia_releases_e.html, 11.5 minutes).
- 3) A video on climate change is available at the Canadian Council of Forest Ministers' site (<http://www.sfmcanada.org/english/ViewVignette.asp?vid=7> and <http://www.sfmcanada.org/francais/ViewVignette.asp?vid=7>, 2.5 minutes).

